

Serial No. 10/500,722

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New Claims 10 and 11 essentially correspond to Claims 8 and 9 with the difference that the newly added claims depend, either directly or indirectly, upon Claim 5 instead of Claim 1. No new matter has been added.

The Examiner requested that applicants provide a translation of the International Preliminary Examination Report (IPER), and applicants have enclosed herewith a copy of the requisite paper. The Examiner also requested that applicants review the specification for errors. Applicants did not become aware of errors and, accordingly, no corrections were effected.

The Examiner rejected Claims 1 to 9 under 35 U.S.C. §102(b) as being anticipated by or, in the alternative, under 35 U.S.C. §103(a) as being unpatentable in light of the teaching of *Zehner et al.* (US 4,778,929). In particular, the Examiner argued that *Zehner et al.* taught, in col. 5, indicated lines 20 to 35, of the reference, a process for the continuous hydroformylation of an olefin of 2 to 4 carbon atoms with CO/H<sub>2</sub> gas mixture in presence of rhodium complex as a catalyst in a liquid reaction zone wherein a major part of the material was recycled to the reactor.

It is respectfully noted that *Zehner et al.* state in the referenced section<sup>2)</sup>

*... the gaseous products and reactants being removed from said reactor, the products being isolated and the major part of the remaining gas being recycled to the reactor ...*

In contrast thereto, applicants' process comprises withdrawing a stream (S) from the liquid phase present in the reaction zone and, after removing heat, returning the stream to the reaction zone without removal of a material component, e.g. product or starting material.<sup>3)</sup> Accordingly, applicants' process and the procedure of *Zehner et al.* differ in at least two pertinent aspects:

- (1) the stream (S) is withdrawn in accordance with applicants' process from the liquid phase whereas *Zehner et al.* withdraw "gaseous products and reactants;"<sup>4)</sup> and
- (2) the stream (S) is returned in accordance with applicants' process without removal of material components such as product or start-

2) Cf. col. 5, indicated lines 28 to 31, of US 4,778,929. See also col. 1, indicated lines 42 to 46, of the reference.

3) Cf. Claims 1 and 5, and page 3, indicated lines 13 to 15, of the application.

4) Cf. e.g. col. 4, indicated lines 15 to 17, of US 4,778,929.

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ing materials whereas *Zehner et al.* isolate the product and only return a major part of the remaining gas.<sup>5)</sup>

Anticipation under Section 102 can be found only if a reference shows exactly what is claimed<sup>6)</sup> and the teaching of *Zehner et al.* cannot be considered to show the exact process as is defined in applicants' claims. Also, the test for anticipation is one of identity, which means that the identical invention must be shown in the reference in as complete detail as is contained in the claim.<sup>7)</sup> The teaching of *Zehner et al.* clearly fails this test.

Moreover, the teaching of *Zehner et al.* is by far too removed from applicants' process to render the claimed subject matter obvious within the meaning of Section 103(a). As explained in MPEP §2143, three basic criteria have to be met in order to establish a *prima facie* case of obviousness:

- (1) There must be some suggestion or motivation, either in the reference itself or in the knowledge generally available to one of ordinary skill in the art, to modify the reference,
- (2) there must be a reasonable expectation of success, and
- (3) the prior art reference must teach or suggest all of the claim limitations.

Additionally, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and cannot be based on the applicant's disclosure.<sup>8)</sup> At least two of these basic criteria are not met in that the suggestion or motivation to do what applicants have done is lacking and the reference fails to teach or suggest all of the pertinent provisions which are set forth in applicants' claims.

Accordingly, it is respectfully requested that the rejection of applicants' claims based on the teaching of *Zehner et al.* be withdrawn. Favorable action is solicited.

Further, the Examiner rejected Claims 1 to 9 under 35 U.S.C. §102(b) as being anticipated by or, in the alternative, under 35

5) Cf. e.g. col. 3, indicated lines 31 to 35, and col. 4, indicated lines 18 to 20, of US 4,778,929.

6) Cf. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985); *In re Marshall* 577 F.2d 301, 198 USPQ 344 (CCPA 1978); *In re Kalm* 378 F.2d 959, 154 USPQ 10 (CCPA 1967).

7) Cf. *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 9 USPQ2d 1913 (Fed. Cir. 1989).

8) *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991).

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U.S.C. §103(a) as being unpatentable in light of the teaching of *Cornils et al.* (US 4, 523,036). In particular, the Examiner argued that *Cornils et al.* taught, in col. 6 indicated lines 55 to 60, of the reference, a process for the preparation of an aldehyde comprising contacting a starting material comprising an olefin, carbon monoxide, hydrogen and water in the presence of a water-soluble rhodium-phosphine complex, as a catalyst in which the removal of the heat of reaction takes place without the aid of an auxiliary medium.

The reference falls, however, also short from showing exactly what is claimed by applicants and fails to show the identical invention in as complete detail as is contained in applicants' claims.

According to the embodiment of *Cornils et al.*'s procedure which is illustrated in Figure 1 of the reference a mixture of reaction product, aqueous catalyst solution, unreacted synthesis gas and olefin with withdrawn from the reactor through a pipe 3.<sup>9)</sup> The respective stream is firstly separated into gaseous components such as synthesis gas and olefin, and a hot liquid phase in a separator 4.<sup>10)</sup> The gaseous components are, at least partially, recycled whereas the hot liquid phase is further separated in a separator 7 into an aqueous phase comprising the catalyst and an organic phase comprising the reaction product.<sup>11)</sup> The reaction product is, after further stripping in column 9, discharged from the system. The same principles are employed in the embodiment of *Cornils et al.*'s procedure which is illustrated in Figure 2 of the reference. In this embodiment two streams, namely stream (27) and stream (33), of reaction mixture are withdrawn from the reactor.<sup>12)</sup> The raw product stream (27) is stripped of dissolved olefin by a countercurrent flow of synthesis gas and subsequently separated into its components in column (29).<sup>13)</sup> The cooled stream of liquid and gaseous components which is conveyed through pipe (21) to the upper part of the reactor (17) and which is removed through line (33) is passed to a phase separator (31) where the organic product containing phase is removed.<sup>14)</sup> The foregoing

9) Cf. Figure 1 and col. 3, indicated lines 61 to 64, of US 4,532,036.

10) Cf. Figure 1 and col. 3, indicated line 64, to col 4, indicated line 3, of US 4,532,036.

11) Cf. Figure 1, and col. 4, indicated lines 3 to 12, of US 4,532,036.

12) Cf. Figure 2 of US 4,532,036.

13) Cf. Figure 2 and col. 4, indicated lines 47 to 51, of US 4,532,036.

14) Cf. Figure 2 and col. 4, indicated lines 39 to 42, and indicated lines 51 to 57, of US 4,532,036.

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shows that the procedure of *Cornils et al.* equally lacks a measure in which a stream is withdrawn from the from the liquid phase present in the reaction zone and the stream is, after removing heat, returned to the reaction zone without removal of a material component.

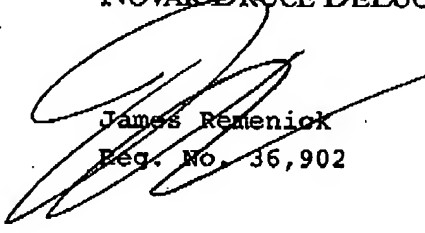
The teaching of *Cornils et al.* not only fails to anticipate applicants' invention within the meaning of Section 102 but also fails to render applicants' process obvious within the meaning of Section 103(a). As was the case regarding the teaching of *Zehner et al.* at least two of the three basic criteria for establishing a prima facie case of obviousness are not met since the teaching of *Cornils et al.* fails to provide for the suggestion or motivation which was necessary for a person of ordinary skill in the art to do what applicants have done, and the reference fails to teach or suggest all of the pertinent provisions which are set forth in applicants' claims.

It is therefore respectfully requested that the rejection of applicants' claims based on the teaching of *Cornils et al.* be withdrawn. Favorable action is solicited.

Please charge any shortage in fees due in connection with the filing of this paper, including Extension of Time fees, to Deposit Account No. 14.1437. Please credit any excess fees to such deposit account.

Respectfully submitted,

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Encl.: CLAIM AMENDMENTS (Appendix I)  
Translation of IPER

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## A P P E N D I X I:

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CLAIM AMENDMENTS:

Cancel Claim 8, amend Claim 1 and 9, and enter new Claims 10 and 11, as indicated in the following listing of the claims:

1. (currently amended) A hydroformylation process in which at least one olefin having from 2 to 6 carbon atoms is reacted continuously with carbon monoxide and hydrogen in the presence of a hydroformylation catalyst in a reaction zone in which a liquid phase is present and a stream S) is taken from the liquid phase, heat is removed from this stream and the stream is subsequently returned to the reaction zone without removal of a material component, wherein the reaction proceeds in the stream S) at least until the removal of the heat and carbon monoxide and/or hydrogen are/is fed into the stream before it is depleted in these/these component(s) to such an extent that the remaining components undergo undesirable secondary reactions and/or the hydroformylation essentially stops.
2. (original) A process as claimed in claim 1, wherein the heat is withdrawn from the stream S) by bringing it into contact with a heat exchanger.
3. (previously presented) A process as claimed in claim 1, wherein the heat withdrawn from the stream S) is used in a heat-consuming step of the hydroformylation process or of another process.
4. (previously presented) A process as claimed in claim 1, wherein the heat is withdrawn from the stream S) without use of an auxiliary medium for heat transfer.
5. (previously presented) A process as claimed in claim 1, wherein
  - i) an olefin-containing feed stream comprising at least one olefin having from 2 to 6 carbon atoms and also carbon monoxide and hydrogen are fed into a reaction zone and reacted in the presence of a hydroformylation catalyst, where a liquid phase is present in the reaction zone and a stream S) is taken from this liquid phase, heat is withdrawn from the stream and the stream is subsequently returned to the reaction zone without removal of a material component,

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- ii) an output is taken from the reaction zone and is subjected to a single-stage or multistage separation operation to give at least one stream comprising the major part of the hydroformylation product and a stream comprising the major part of the unreacted olefin, and
  - iii) at least part of the stream comprising the major part of the unreacted olefin is returned to the reaction zone.
6. (original) A process as claimed in claim 5, wherein the stream comprising the major part of the unreacted olefin is obtained by firstly separating off a crude hydroformylation product from the output from the reaction zone and subjecting it to a degassing step, with the heat withdrawn from the stream S) being used to cover at least part of the heat requirement of the degassing step.
7. (previously presented) A process as claimed in claim 5, wherein the stream comprising the major part of the unreacted olefin further comprises saturated hydrocarbons and is separated by distillation into an olefin-enriched fraction and an olefin-depleted fraction, with the heat withdrawn from the stream S) being used to cover at least part of the heat requirement of the distillation.
8. (canceled)
9. (currently amended) A process as claimed in claim 1, wherein carbon monoxide is fed into the stream S) before it is depleted in this to such an extent that the olefin reacts with the hydrogen to form hydrogenation products.
10. (new) A process as claimed in claim 5, wherein the reaction proceeds in the stream S) at least until the removal of the heat and carbon monoxide and/or hydrogen are/is fed into the stream before it is depleted in these/this component(s) to such an extent that the remaining components undergo undesirable secondary reactions and/or the hydroformylation essentially stops.
11. (new) A process as claimed in claim 10, wherein carbon monoxide is fed into the stream S) before it is depleted in this to such an extent that the olefin reacts with the hydrogen to form hydrogenation products.

**Translation****PATENT COOPERATION TREATY**

PCT/EP2003/000419

**PCT****INTERNATIONAL PRELIMINARY EXAMINATION REPORT**

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>M/41521-PCT</b>	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/EP2003/000419</b>	International filing date (day/month/year) <b>16 January 2003 (16.01.2003)</b>	Priority date (day/month/year) <b>17 January 2002 (17.01.2002)</b>
International Patent Classification (IPC) or national classification and IPC <b>C07C 45/50</b>		
<b>CORRECTED</b>		
<b>Applicant</b> <b>BASF AKTIENGESELLSCHAFT</b>		
<b>VERSION</b>		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand <b>18 July 2003 (18.07.2003)</b>	Date of completion of this report <b>01 April 2004 (01.04.2004)</b>
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

Form PCT/IPEA/409 (cover sheet) (July 1998)

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## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/EP2003/000419

## I. Basis of the report

## 1. With regard to the elements of the international application:\*

☐ the international application as originally filed☒ the description:

pages

1-12

pages

, as originally filed

pages

, filed with the demand

, filed with the letter of

☒ the claims:

pages

pages

pages

pages

1-8

, as originally filed

, as amended (together with any statement under Article 19

, filed with the demand

, filed with the letter of 03 March 2004 (03.03.2004)

☐ the drawings:

pages

pages

pages

, as originally filed

, filed with the demand

, filed with the letter of

☐ the sequence listing part of the description:

pages

pages

pages

, as originally filed

, filed with the demand

, filed with the letter of

## 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item. These elements were available or furnished to this Authority in the following language

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.



## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

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## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims	1-8	YES
	Claims		NO
Inventive step (IS)	Claims	1-8	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-8	YES
	Claims		NO

## 2. Citations and explanations

Reference is made to the following document:

D1: DE-A 19836807

**Novelty**

The present application describes a method for the hydroformylation of  $C_{2-6}$  olefins with carbon monoxide and hydrogen. The reaction is carried out in a reaction zone that contains a liquid phase. A stream S is taken from the liquid phase, the heat is extracted from this stream and then the stream is fed back into the reaction zone without any material component having been removed. Before any unwanted ~~secondary reactions occur and/or~~ hydroformylation takes place, carbon monoxide and/or hydrogen is fed into this stream, in which the reaction continues until the heat has been removed.

Document D1, which is regarded as the closest prior art, describes a hydroformylation method comprising a liquid phase. A partial stream is taken from this liquid phase and is fed through a heat exchanger. The stream is then fed back into the reaction zone

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without any material component having being removed; see D1, figure 1, cycle 3, heat exchanger 12. The olefins used are those with 2 to 20 C atoms. D1 does not describe the addition of hydrogen and/or carbon monoxide to the partial stream S. The subject matter of claims 1 to 8 thus appears to meet the requirement of PCT Article 33(2).

**Inventive step**

The claimed method has the particular technical advantage of reducing secondary reactions resulting from the partial stream being depleted of carbon monoxide and/or hydrogen. The amount of unwanted propane can be reduced, for example by the addition of oxo gas or CO.

The application can therefore be considered to address the problem of developing an improved hydroformylation method.

This problem was solved by the claimed method; see comparative example 1 and examples 3 and 4.

Such a solution is not suggested by the prior art. Consequently, ~~claims 1 to 8 appear to involve an~~ inventive step (PCT Article 33(3)).

**Industrial applicability**

There are no objections regarding the industrial applicability of the claimed method.

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## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

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## Further observations

Contrary to PCT Rule 5.1(a)(ii), the description does not cite document D1 or indicate the relevant prior art disclosed therein.

The description has not been brought into line with the amended claims.

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